

# Cost overruns in Building Construction Projects: A Case Study of a Government of Ghana Project in Accra

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## Abstract

Cost overruns leading to delays are common in building construction projects in Ghana. A construction project comprises of two distinct phases: the pre-contract phase - the period between the initial conceptions of the project and the signing of the contract and the post-contract phase – the period after the award of the contract when actual construction begins through to its completion. Although cost overruns occur in both phases, majority of the causes occur in the post contract phase. This paper focuses on the post-contract phase of the building project and the initiation for this was due largely to personal observation and the low performance of the building project in terms of cost, time and quality. The paper seeks to identify factors contributing to high cost overruns in the renovation of a building project in order to investigate the extent of possible impact on building projects. Results from the study indicate that several factors contributed to the high cost overruns but salient among them was that, the total cost of additional works not initially included in the total estimate in the bills of quantities was high. An item of work whose initial cost was difficult to determine and as such was given provisional sums was later found to be exceptionally lower than the actual cost. The changes in the specifications and details of materials or components and the non-prompt payment of the contractor led to construction delays and increase in fluctuation costs.

**Keywords:** Cost Overruns, Pre-Contract, Post-Contract, Provisional Sums, Delays.

## 1. Introduction

Generally, the delay in the implementation of many building projects undertaken by government leading to cost overruns is obvious to many. The construction industry plays a very significant role in the socio-economic development of the nation. The interrelationship between the construction industry and the broader economy emanates largely from three of the industry's characteristics namely: the public sector client as its major client, its large market size with the ability to produce investment or capital goods which contribute significantly to the national GDP, and as a major source of employment both directly and indirectly by its multiplier effect. In Ghana, the construction industry is the highest recipient of government budget in terms of government development programmes.

The building construction industry has special features that are not usually encountered in other industries. When conditions in the field tend out to be more complex than what was anticipated in the planning and design phase, additional cost and time are needed. Any extremes can affect productivity levels. Moreover, the industry is custom oriented, meaning it is difficult to use mass production techniques. Because of all these factors, it is difficult to predict accurately how much money will be required to complete construction projects. Cost overruns, delays and other problems tend to be proportionally monumental (Gould, et al, 2002). Cost is one of the primary measures of a project's success. This is true for public buildings in developing countries like Ghana because, public building construction projects are executed with very scarce financial resources. The common criteria for project success by most literature on construction projects are generally considered to be cost, quality and time. A building project is considered successful if it is completed within the stated budget, on schedule, conform to user expectations, meet specifications, and achieve quality of workmanship and with minimized construction aggravation (Songer and Mollenaar, 1997).

In Ghana, the present state of the construction industry falls short of meeting domestic and international quality standards and the performance demand expected from the sector. The critical problems faced by the construction industry are the inability to complete projects on schedule, low quality work and high cost overrun. In general, most (if not all) building construction projects experience time and cost overrun during their execution phase.

## 2. Literature Review

Cost Overrun is defined as the amount by which actual costs exceed the baseline or approved costs (Wideman, 2002). It is the difference between the original cost and the actual cost when the project is completed (Avots, 1983). For the purpose of this paper, cost overrun is defined as the difference between the final cost of a construction project at completion and the contract amount, agreed upon between the client and the contractor during the signing of the contract.

### *2.1 Causes of Cost Overruns*

The causes of cost overrun in building projects are varied, some are not only difficult to predict but also difficult to manage (Morris and Hough, 1991). A study made in Turkey by Arditi, et al, in 1985 showed that the causes of construction cost overruns were attributed to inflationary pressures, increases in material prices and workmen's wages, difficulties in obtaining construction materials, construction delays, deficiencies in cost estimates prepared by the consultants and the unexpected sub-soil conditions. Mansfield, Ugwu and Doran in 1994 found out that, cost overruns were attributed to problems in finance and payments arrangements, poor contract management practices, material shortages, changes in site conditions, design changes, mistakes and discrepancies in contract documents, mistakes during constructions, price fluctuations, inaccurate estimating, delays, additional works, shortening of construction periods, and fraudulent practices and kickbacks. According to Robert F. Cox (2007), project owners identified five reasons for project cost overruns. They were incomplete drawings, poor pre-planning processes, escalating cost of materials, lack of timely decision and excessive change orders. The User's Guide 2005 also gives the following factors as contributors to project cost overruns with time: poor project management, design changes, unexpected ground conditions, inflation, shortages of materials, change in exchange rates, inappropriate contractors, funding problems and force majeure. Frimpong et al., 2003, also found out that in Ghana, in addition to all factors mentioned above, construction cost overruns are also caused by problems with the payment of agencies' fees.

Studies have also shown that, the size of a building project influences the rate of cost overrun. Large projects are generally more complex and in such complex projects, some items are fraught to be missed out or may be forgotten during the planning and design phases. Hence, the complexity may increase the rate of cost overrun. The factors that could increase construction costs are numerous. Chan and Park, 2005 stated that the cost of a building project is affected by a large number of factors. This is so because construction is a multidisciplinary industry and its work involve many parties such as the project owner and various professionals, contractors and suppliers. Thus a building project cost does not only depend on a single factor but on a cluster of variables that are related to the characteristics of the project, the construction team as well as the market conditions.

### *2.2 Factors That Affect Building Project Cost*

No two infrastructure projects will cost the same amount of money no matter how similar they are. Apart from the basic technical factors, the wide range of economic and institutional conditions in different locations will itself lead to variations. Nevertheless, the fundamental project costs are based on the actual cost of the land, materials, equipments and labour in the region where the project is being carried out. These basic costs will vary depending on the factors discussed below:

- **The Project Specification**

The specification defines the physical attributes of a project. For buildings, the required function and expected occupancy rate will lead to a specification of total floor space and floor plate size, room height, internal and external aesthetics, floor loadings, heating and lighting requirements. The more detailed the specification and the larger the project, the more expensive it will be.

- **Location Of the Building Project**

The location of a project affects its cost through institutional and geographical realities. Institutional factors can affect the initial project cost in a number of ways. Consents procedures may be more difficult, thus affecting the time it will take to implement the project successfully. Where major projects are likely to be opposed on environmental grounds, more costs may have to allow for environmental mitigation measures. In geographical terms, building material costs, land costs and design standards vary widely across Ghana because of the varying distances from suppliers and the general market conditions.

- **New Buildings or Refurbishment**

Generally, the construction of a new infrastructure is more expensive than the refurbishment of existing buildings. This is primarily so because the cost of the land, foundations cost, service provision costs, etc. are not included when simply upgrading existing structures.

- **Timescale**

Generally, the longer a project takes to complete, the greater the project cost will be. Project timescales are dependent on the specification of the project. There is a general notion that, the larger a project is, the longer it will take to complete. This is not always the case because when additional resources are used, the project implementation can be accelerated. In some instances, work on a building project may take a lot longer than expected because, its phasing is dependent upon the other or linking projects or public finance programmers.

- **Site Characteristics**

A site can be affected by soil and drainage conditions which can restrict access and can affect the original cost estimates. The amount of excavation and foundation activities required is particularly affected by poor ground conditions. Where there is uncertainty about ground conditions, accurate project cost estimates cannot be

achieved unless a soil survey is conducted.

- Inaccurate or Poor Estimating of Original Cost

Peters and Madauss, 2008 stated that the biggest factor that contributes to overruns of budget is inaccurate estimation of original or initial cost of the project. This is due to technical problems on how to estimate project costs and also insufficient project information at the early stages of the project.

- Inflation of project costs

Inflation of materials, equipments and labour costs may vary geographically within the country and contracts between sub-contractors and suppliers may involve different inflation protection terms as agreed with the client. As inflation increases, interest rates also increases and the project costs will also increase.

- Fluctuation in price of raw materials

In most cases where it is difficult to estimate the material cost accurately, price fluctuation gives rise to cost overruns. Fluctuation may also be associated with high changes in prices of materials especially in developing countries.

- Unforeseen site conditions

Nega, 2008 found out that actual site condition of a project are not usually determined until excavation is completed. It is sometimes possible that site condition are overlooked by initial review, or conditions have changed due to change in weather or subsoil conditions which sometimes will require fundamental redesign of the project with its attendant high costs.

- Insufficient funds

Long et al, 2008 pointed out that, whenever there is insufficient funds to cover all the expenses during construction, most projects are delayed. Clients sometimes do not have enough funds to complete their projects and more often than not, do not pay contractors on time as agreed in the contract agreement.

- Construction cost under-estimation

In order to get the project approved for construction, some parties to the contract deliberately under estimate the cost of the project only to be faced with the actual costs as construction proceeds. This negative practice affects the project cost, thus high cost overruns.

- Change in foreign exchange rates

The change in foreign exchange rate is particularly relevant if materials or other elements of the construction project are being purchased from foreign countries. If the foreign exchange rate changes beyond the expected level, then the cost of the project may increase and that automatically leads to cost overrun.

### *2.3 Effects of Cost Overruns*

Cost overruns have obvious effects for the key stakeholders in particular and the building construction in general. To the client, cost overruns implies added costs high over and above those initially agreed upon at the pre-contract phase, resulting in less returns on investment. To the end user, the added costs are passed on as higher rental or lease costs. To the professionals, cost overruns imply inability to deliver value for money and could well tarnish their reputations leading to loss of confidence reposed in them by clients. To the contractor, it implies loss of profit for non completion and defamation that could jeopardize his/her chances of winning future contracts, if at fault. To the industry as a whole, cost overruns could bring about project abandonment and a drop in building activities, bad reputation and inability to secure project finance or secure projects at higher costs due to added risks (Mbachu and Nkado, 2004). All these consequences undermine the viability and sustainability of the building construction industry.

## **3. THE STUDY**

Information available has shown that, the contract for the renovation of a Government of Ghana (GOG) bungalow in Accra was signed in May 2009 at an initial cost of GH¢ 169,137.16. A discount of 15% was allowed for by the contractor. Hence the actual tender sum came to GH¢ 169,092.54. As per the original Approved for Construction drawings (AFC), this tender figure was enough to complete the whole of the renovation works within a period of nine (9) months. As such, it was expected that the contractor should have handed over the building to the client by February, 2010.

Unfortunately, this was not the case. Several modifications to the original AFC drawings, issuance of Variation Orders and other contributory factors has caused the renovations works to delay unduly – thus affecting the tender figure.

### *3.1 Factors Contributing To High Cost Overruns In The Renovation Works*

#### *3.1.1 Additional Works*

- *Conversion of Existing Garage to Kitchen*

The existing kitchen with a floor area of 11.48m<sup>2</sup> was too small to accommodate its accompanying accessories and fixtures. Hence there was the need to convert the garage with a gross floor area of 18.45m<sup>2</sup>, to a kitchen to

add to the existing one to have an overall total floor area of 29.93m<sup>2</sup>. Works to be done in converting the garage to a kitchen included demolishing part of the block wall separating the existing kitchen and the garage, construction of new block wall to replace the garage door, creating door and window openings. The depth of the garage was lower than the kitchen depth by 600mm. In order to achieve a uniform floor level and to avoid any steps in the new kitchen, there was the need to fill up the garage space with fine sand to a height of 600mm thus, by volume 11m<sup>3</sup> of fine sand. The final floor finish was changed from ordinary cement and sand screed to porcelain floor tiles. All these attracted additional costs to the contract price.

- *Change of Windows and Provision of Burglar Proofing at the Ground Floor*

As per the contract document, the window openings was to have wooden frames with 50 x 50 x 4mm thick welded burglar proof mesh and metal bars fixed through them and aluminium frames with glass louvre blades within the frames. All these were changed to aluminium glazed sliding windows. Comparatively, the actual cost of the aluminium glazed windows to the wooden frames and glass louvre blades was very high. Although there was an omission of the wooden frames and glass louvre blades, the cost difference was still very significant. The provision of burglar proofing to all the windows at the ground floor was an after-thought. As such, this also attracted some additional costs to the tender figure.

- *Expanded External Works*

Due to the uncertainties surrounding the external works at the time of bill preparation, a provisional sum of GH¢20,000.00 was allowed to take care of all works that would be executed. Unfortunately, due to the extensive area (additional areas) surrounding the building and the volume of external works to be carried out, this amount was woefully inadequate. The actual cost for executing the external works including landscaping, drainage and parking lots was GH¢ 32,624.00

No provision was also allowed for the main entrance metal gates in the contract BOQ. The actual cost for the provision of the entrance metal gates was GH¢4,485.00.

Table 1 pg 11 below shows that the sum of the variances of these additional works contributed to the increase in the total contract price.

Other factors which contributed to high cost overruns was the modification of the structural components of the building, the expansion of the gross floor areas from 211m<sup>2</sup> (ground and first floor of original drawing) to 231m<sup>2</sup> (ground floor of AFC drawings) and 220m<sup>2</sup> (first floor of AFC drawings).

### 3.2 Variation Orders / Site Instructions

During the course of constructing the works, variation orders were issued by the project architect for some but not limited to the following:

- Provision of marble floor finish at the staircase and living areas,
- Changes in electrical and lighting points,
- Provision of additional air-conditions,

Variation orders may have a positive impact (omission or a reduction) in the tender price or a negative impact (addition or an increase) in the tender price. Most of the variation orders issued rather tended to increase the tender price, hence high cost overruns on the project. The variance in table 2 page 11 below (Ref List of Tables pg 11) shows the high cost overruns that would be attracted to the project.

### 3.3 Fluctuations

The Conditions of the Contract allowed that the Local Price Adjustment Formula (LPAF) was to be used as the basis to calculate all fluctuations. Thus the Building and Road Research Institute (BRRI) local price adjustment formula as stipulated in the conditions of contract was adopted by the contractor to calculate all fluctuations.

$$\text{Cost Index} = U_a = \frac{F(F_a - F_o)}{F_o} + \frac{M(M_a - M_o)}{M_o} + \frac{L(L_a + L_o)}{L_o} + \frac{P(P_a + P_o)}{P_o}$$

Where

$U_a$	=	Price adjustment for the unit rate at the time of assessment (a)
$F_a$	=	Foreign exchange rate as at time (a)
$M_a$	=	Local raw material input as at time (a)
$L_a$	=	Local labour input as at time (a)
$P_a$	=	Fuel input cost as at time (a)
$F_o$	=	Foreign exchange rate at base index
$M_o$	=	Local raw material input at base index

The 'a' and 'o' suffix represent the current and base indices respectively for the identified input cost component. From the award of the contract to date, the total amount of fluctuations paid amounted to GH¢ 64,577.58 representing 38.19% of the tender figure. This can be attributed to increases in prices of materials and labour

wages as well as the delay in honouring interim certificates on time. A breakdown is as detailed in Table 3 pg 12 below.

### 3.4 Delays

Delays in the completion of a particular work section within a period of time led to an upward adjustment in the fluctuation index within that particular period thus, additional cost is accrued onto the tender price.

Although the contractor projected to complete the project within nine (9) months from the date of signing the contract and to date has not fully completed the renovation of the bungalow, there is clear indication that the project will suffer very high cost overruns. The delays in completing the project on schedule cannot be placed entirely at the door step of the contractor. The regulatory bodies in charge of paying interim certificates promptly should also be partly to be blamed. The cumbersome and bureaucratic processes involved in releasing funds promptly (or occasionally, unavailability of funds to pay contractors) are all contributory factors to cost overruns.

### 3.5 Actual Provisional Sums Against Estimated Provisional Sums

During construction, it was realized that the estimated provisional sums of some items of work was woefully inadequate to meet the current prices of these items. Some items of work were later added to the scope of the contract. Table 4 pg 13 elaborates further:

### 3.6 A Comparative Analysis of Costs of the Various Works between the Bills of Quantities, the Contractor's Estimates and the Actual Estimates.

Table 5 pg 14 below shows the total costs of the various work sections from the BOQ, the contractor and the consultant. Figures for the contractor and consultants estimates were obtained from the current interim valuation certificate (valuation No.7) which represents 98% completion. It is worthwhile to note that, these estimates excluded all fluctuations.

It can be seen that, the total estimate for the contractor exceeded the total contract sum by GH¢ 205,434.66 representing an overrun of 121.49%. Careful analyses of all the interim certificates submitted by the contractor showed that, most of the items that was agreed to be omitted by all the parties to the contract were still being charged to the client. Although instructions were given for additional works, some quantities of items of work executed were higher than the re-measured works. Also quotations given for works outside the scope of the contract were gargantuan.

The consultants on the other hand critically analysed every interim valuation certificate submitted by the contractor for payment. No payment was made for all omitted items. Checks were conducted to ensure that all quantities were re-measured and actual quantities were certified for payment. Thus the difference between the consultant's total estimate and the tender figure was GH¢101,849.39 representing an overrun of 60.23%.

The gross value of work done as at valuation no.7 as indicated by the contractor was GH¢374,527.40 while that submitted by the consultants was GH¢270,941.93

### 3.7 Relationship between Contractors's Interim Certificate for Payment and the Certified Interim Certificate from the Consultants.

An analysis was also carried out to determine the relationship between interim certificates submitted by the contractor and that certified for payment by the consultant. It was detected that, certificates submitted by the contractor for payment increased drastically as work progressed. Reasons for these high costs were due to inclusion of omitted quantities, unfounded high quantities of items of additional works as already elaborated upon. By the consultants estimates, the actual value of works done to date excluding fluctuations was GH¢270,941.93 as shown in the table 6 pg 15.

## 4. Effects of Cost Overruns

### 4.1 Delays

As observed from the analysis above, one of the most common effects of cost overruns was delay. Delays in project completion can be attributed to factors such as:

#### 1) Non prompt payment of interim certificates

In Ghana, most contractors are subjected to tremendous difficulties before they receive payment for work done. The long and complex bureaucratic processes involved in checks and re-checking of all certified certificates for completed projects by the various departments involved, in a bid to avoid any financial loss to the state tend to have a negative impact on the contractor's cash flow. In effect the contractor has no further option than to abandon the site and move in and out of offices in an attempt to get his certificate honoured. This ultimately has a negative effect on the completion time of the project.

#### 2) Variation Orders

Variation occurs mostly during the construction phase of the project. The issuance of the variation order by the



client or his representative sometimes takes a long time, thus affects the construction programme and the contract duration adversely.

### 3) Cash Flow

When funds meant for completed projects or for the commencement of new projects are not released on time, it delays the project and ultimately affects the contract price.

Construction delays affect the client, the consultant and the contractor in honouring his contractual obligations. Further delays in construction will increase costs tremendously.

## 4.2 Additional Costs

### 1) Additional Works

Additional works occur from time to time during the construction phase of a project. Excessive cost overruns will require that, additional budget will be needed to complete a particular project. This in turn will absorb the scarce financial resources available and eventually a budget short fall for construction projects will be created.

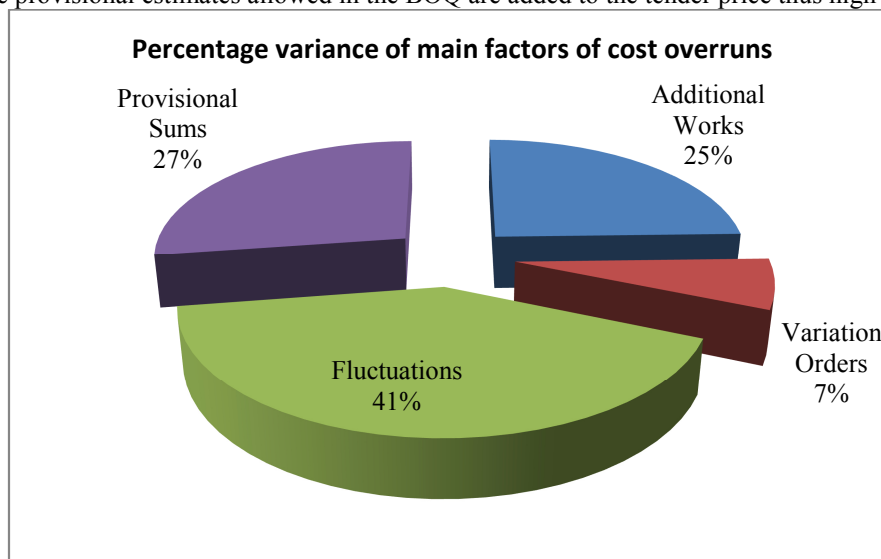
### 2) Fluctuations

In Ghanaian construction projects, fluctuations are very common throughout its entire phase. Fluctuations are the result of increases in labour costs as well as prices of materials and services due to high inflation rates. Because the Ghana cedi is very much unstable with the other major trading currencies like the United States Dollar, British Pound, etc., prices of materials will vary significantly to keep up with the exchange rate. Tenders quoted in Ghana cedis are likely to attract fluctuations.

In order to minimize the effects of fluctuations on project costs, most projects in Ghana are quoted in US Dollars but all claims are paid in cedis using the prevailing exchange rate. This is to ensure that, the changes in cost during construction do not affect the tender price greatly.

### 3) Inaccurate Estimates / Provisional Sums

Inaccurate estimating of a project cost can be very expensive to the client. When enough feasibility studies are not conducted and all items of work not fully priced in the Bills of Quantities (BOQ) before works commences, the actual costs of these items of work are determined during construction. These costs which are usually rather higher than the provisional estimates allowed in the BOQ are added to the tender price thus high cost overruns.



**Figure 1: Percentage variance in terms of cost of construction**

## 4.3 Adversarial Relationship Among Parties

Cost overruns could result in antagonistic relationships among the parties to the contract. Cost overruns could lead to a significant drop in building activities, bad reputation and inability to secure project finance easily in future. Other effects of costs overruns worth mentioning are:

- i. Poor quality of workmanship
- ii. Poor cash flow of the client affecting the contractor
- iii. Distortion of fair and equitable distribution of the scarce resources
- iv. Continuous cash in-flows at the expense of other on-going projects.

## 5. Conclusion

In developing countries like Ghana, financial resources are so scarce that issues related to cost are very sensitive. The identification of the causes of cost overruns in construction projects is a precondition to minimize or avoid it

entirely. From our observations, the following conclusions are drawn:

1. Additional Works

The renovation of the building was interspersed with some additional works. Analysis of table 1 pg 14 showed that, the total variance was ₦38,287.16 (22.64%) for some of the additional works. This percentage of added cost increased the contract price.

2. Variation Orders

The cost of variation orders issued during construction had a negative impact on the tender price. Although some items of work were omitted, the difference between the additional and omitted items was very significant. An analysis of table 2 pg 14 showed that the difference between the actual cost of any site instruction and the amount provided in the BOQ was very wide. Hence additional costs were incurred that led to high cost overruns of the project.

3. Fluctuations

The general delay in completing the renovation works within the contract period led to high fluctuation costs. Incremental changes in the prices of materials, labour wages and services are also contributory factors of fluctuation. The total amount of fluctuation added / paid to the contract was ₦64,577.58 representing 38.19% increase.

4. Delays

The delay or non-payment of certified certificates by the funding agency, the late issuance of variation orders and the limited cash flow of the client are all contributors to the delay of the project. Any further delay in construction would adversely affect the project cost.

5. Provisional Sums

Provisional sums allowed for in the contract BOQ was inadequate to absorb the current prices of those items of work done. Some other items of work not initially allowed for in the contract BOQ were later added which contributed to the high cost overruns.

## 6. Recommendations

From the findings of this research, the following recommendations are provided to ensure that cost overruns on future projects are avoided or minimized.

- 1) Comprehensive site investigation should be carried out at the design phase of the project in order to avoid variations (additions and omissions) that are likely to occur during construction. All aspects of possible changes should be considered thoroughly before construction begins in order to avoid undue changes and delays.
- 2) As much as possible, all design discrepancies and errors as well as omission in design work must be completed with clearly defined scope of work before construction starts.
- 3) The client or funding agency should ensure that adequate funds and other sources of funds are available before construction work starts. This will ensure that, contractors are paid according to the contract agreement.
- 4) All cumbersome processes (bottlenecks) involved in the payment of certified certificates to contractors should be eliminated. This will allow prompt payment and avoid unnecessary delays in payment. The period for honouring interim certificates as indicated in the contract document must be strictly adhered to by the client.
- 5) Government must help stabilize the cedi against the major trading currencies. This will eventually help keep prices of materials and labour stable.
- 6) Proper and realistic approximate estimates should be obtained for all provisional items during the construction phase.
- 7) All parties to the contract should ensure that they abide by the rules of the contract to avoid undue delays to the project. The contractor should be carefully monitored to avoid possible lapses that he can hijack to his advantage to delay the current and probable future projects.
- 8) There should be continuous co-ordination and direct communication between the parties to the contract.
- 9) All contractor and client requests and queries must be quickly responded to for clarification, to avoid associated delays and confusions which will eventually lead to cost overruns.
- 10) Measures must be put in place to reduce construction costs, since this is one way of reducing potential cost overrun.
- 11) The selection of a contractor should be based on expertise, financial standing, capacity and experience and not merely on the basis of price and time offerings as well as fraternal acquaintances.
- 12) Efficient management of time through proper resource planning, duration estimating, cost control and constructing programming must be ensured to avoid delay and hence, to avoid cost overrun due to delay

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## LIST OF TABLES

Table 1: Additional Works at a Glance

Work Description	Original	Actual	Variance
Conversion of garage to kitchen	-	GH¢ 1,434.15	GH¢ 1,434.15
Provision of collapsible burglar proofing and glass block	-	GH¢ 19,744.01	GH¢ 19,744.01
Expanded external works	GH¢ 20,000.00	GH¢ 32,624.00	GH¢ 12,624.00
Main entrance gates	-	GH¢ 4,485.00	GH¢ 4,485.00
Work Description	Original	Actual	Variance
Conversion of garage to kitchen	-	GH¢ 1,434.15	GH¢ 1,434.15
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Main entrance gates	-	GH¢ 4,485.00	GH¢ 4,485.00

Table 2: Variation Orders for contract

Variation Orders	BOQ Quote	Actual	Variance
Provision of marble floor finish	-	GH¢ 4,410.00	GH¢ 4,410.00
Changes in electrical and lighting points	GH¢ 1,131.00	GH¢ 5,692.68	GH¢ 4,381.68
Additional air-conditions	GH¢ 8,000.00	GH¢ 9,500.00	GH¢ 1,500.00



DESCRIPTION	CLAIM No.							
	1	2	3	4	5	6	7	TOTALS
Preliminaries	-	-	-	1,368.81	-	429.28	-	1,798.09
Earthworks	-	-	-	991.61	-	-	-	991.61
Concrete	2,519.65	5,912.63	175.06	599.82	5,939.64	(3,921.00)	-	11,225.80
Reinforcement	808.55	9,703.77	667.52	235.60	-	-	-	11,415.44
Formwork	553.14	1,503.30	143.00	106.19	-	-	-	2,305.63
Blockwork	873.50	873.50	554.95	410.89	-	(159.96)	-	2,552.88
Roofing	-	-	2,032.37	-	-	-	-	2,032.37
Carpentry	-	-	1,674.85	-	-	-	-	1,674.85
Joinery (frames)	-	-	217.02	-	794.00	(19.87)	(99.60)	891.55
Metal work	-	-	-	-	-	461.24	-	461.24
Plumbing works	115.94	115.94	22.14	1,062.54	2,105.90	360.28	-	3,782.74
Mech & Electrical	-	-	771.27	2,847.07	403.85	276.10	3,929.24	8,227.53
Finishings	274.35	274.35	458.40	2,997.62	2,861.13	453.74	-	7,319.59
Anodised Al.Glazing	-	-	-	3,749.90	3,961.93	(128.12)	(211.90)	7,371.81
Painting & Décor	-	-	-	2526.45	-	-	-	2,526.45
					TOTAL FLUCTUATIONS			<b>64,577.58</b>

ITEM	DESCRIPTION	BOQ (GH¢)	ACTUAL(GH¢)	VARIANCE(GH¢)
A	Kitchen Cabinets	1,000.00	6,823.60	5,823.60
B	Septic Tank	1,700.00	5,677.00	3,977.00
C	Marble Floor finish	-	4,410.00	4,410.00
D	Entrance gates	-	4,485.00	4,485.00
E	8 No. manholes	160.00	9,370.45	9,210.45
F	External works	20,000.00	32,624.00	12,624.00
G	Industrial fan extractor	-	550.00	550.00
H	3-Phase meter	-	1,500.00	1,500.00
		Total Overruns		<b>42,580.05</b>

Table 5 A Comparative Analysis of Costs of the Various Works between the Bills of Quantities, the Contractor's Estimates and the Actual Estimates.

ITEM	DESCRIPTION	BOQ ESTIMATE	CONTRACTOR'S ESTIMATE	ACTUAL ESTIMATE
A	Preliminaries	11,550.00	11,550.00	11,550.00
B	Demolition and Alteration	2,000.20	3,864.20	3,864.20
C	Substructure	14,093.00	19,424.00	19,424.00
D	Concrete works	20,228.00	57,776.00	57,776.00
E	Blockwork	5,759.00	7,059.00	7,059.00
F	Roofing	6,080.00	6,080.00	6,080.00
G	Carpentry	7,031.50	7,031.50	7,031.50
H	Joinery	8,699.50	24,905.50	11,988.10
J	Metal work	2,125.00	18,340.00	4,485.00
K	Plasterwork and other finishings	18,288.00	34,188.50	23,388.00
L	Glazing	22,250.00	22,550.00	21,500.00
M	Painting and Decoration	7,095.50	8,996.00	8,996.00
N	Plumbing Installation	11,603.60	52,304.00	35,578.93
O	Air conditioning	8,762.90	Incl. in Item N	Incl. in Item N
P	Electrical Installation	13,366.20	21,312.00	19,597.20
Q	External works	20,000.00	79,146.50	32,624.00
R	Contingency	20,000.00	-	-
	Sub Total	198,932.40	374,527.20	270,941.93
	Less: Discount 15%	29,839.86		
			205,434.66	101,849.39
	TOTAL CONTRACT SUM	169,092.54		

Table 6 Relationship between Contractors's Interim Certificate for Payment and the Certified Interim Certificate from the Consultants.

INTERIM CERT No.	CONTRACTOR		CONSULTANT		
	AMOUNT GH¢	FLUCTUATION GH¢	AMOUNT GH¢	FLUCTUATION GH¢	OMISSION
1	110,911.94	22,658.75	36,814.41	5,145.12	
2	99,894.53	8,032.93	63,080.12	18,383.49	
3	41,771.99	23,528.61	39,175.89	6,716.59	
4	38,077.90	23,771.61	40,674.00	17,055.02	
5	95,274.16	17,442.39	109,395.98	16,340.01	
6	164,358.71	10,178.81	14,130.56	1,980.32	4,972.55
7	157,122.84	20,931.63	32,248.24	3,929.27	
Total	707,412.07	126,544.73	335,519.20	69,549.82	
	Value of work done to date including fluctuations		<b>335,519.20</b>		
	Fluctuations			69,549.82	
		<u>Less Omissions</u>			
				4,972.55	
	Net Fluctuations			<b>64,577.27</b>	
	Gross Value of work done excluding fluctuations		<b>270,941.93</b>		

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